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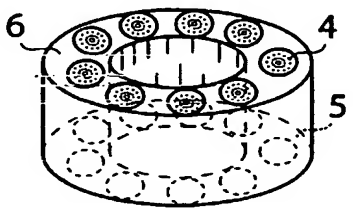
(54) Title: MAGNETIC CONDITIONING APPARATUS FOR DIESEL ENGINE FUEL



(57) Abstract: The invention relates to a magnetic conditioning device for diesel engine fuel comprising a hosing element, placed along the fuel feeding line, having a fuel inlet and a fuel outlet, and providing a septum in correspondence of the inlet to deviate the inlet fuel, and an obliged path for the fuel, being provided at least two opposed magnetic elements. Along said obliged path, inducing a magnetic field on the flowing fuel.

MAGNETIC CONDITIONING APPARATUS FOR DIESEL ENGINE FUEL

The present invention relates to a magnetic conditioning device for diesel engine fuel.

More specifically, the invention relates to a magnetic conditioning device allowing to obtain an enhanced separation of impurities present in the diesel fuel, thus inducing a better ionisation of the same.

Many devices are known since many years employing various magnetic fields to improve the purity of diesel engine fuel.

For example, in U.S. patent N° 5,161,512, and in the corresponding European Patent N° 0 613 399, in the name of AZ industries, Incorporated, filed on September 17, 1992, it is described a magnetic conditioning device for fluids, wherein opposed magnetic poles of relevant aligned magnets are provided, with radial lines inclined in a different way with respect to the central axis of the conduit within which the fuel flows.

In U.S. patent N° 5,359,979, filed on March 29, 1994, it is described a magnetic conditioning device for fluids, with a plug made up of ferromagnetic material, extending within the inner hole of an annular permanent magnet, divided by a well defined space. A pair of ferromagnetic ends are coupled to a pair of plates. Magnet emits a focalised, concentrated magnetic field, sliding within the fuel.

In the Italian patent N° 1,269,246, filed on August 3, 1993 in the name of Giuseppe Grieco, it is described a high potential magnetic field particle conditioner for treatment of water and hydrocarbons, comprised of a series of four pairs of permanent magnets coupled on the back to two anchors, with the air gap placed axially aligned with respect to the liquid adduction channels, with two frusto-conical portions connecting the channels with the air gap.

In the Italian Utility Model Patent N° 244,584 filed on October 27, 1998 in the name of BI.MA.TEC S.r.l. it is described a variable closure body for magnetic conditioning devices for fluids, providing the mounting about a tube through which the liquid fuel flows.

In the Italian patent N° 1,291,252, filed on March 11, 1997 in the name of Roberto Morris it is described a device for magnetic conditioning of fluids by a magnetic field wherein it is provided a

permanent magnet provided outside a diamagnetic tube for the conduction of the fluid in such a way to create a magnetic field passing through the fuel flowing within the tube.

In the Italian patent N° 1,197,346, filed on September 30, 1986 in the name of Olaf Fjeldsend A/S it is described an apparatus for the magnetic treatment of the flowing liquid.

In the U.S. Patent N° 5,141,296, filed on January 28, 1993 in the name of Mearl E. Ellison, it is described a magnetic conditioning device for water, providing an inner chamber with a permanent magnet placed on a plurality of rod-like elements.

In the U.S. Patent N° 4,711,271, filed on December 8, 1987 in the name of Gale M. Weisembarger and John C. Moran it is described a magnetic conditioning device for fluids, having a magnetic flow path to increase the flow density.

In the U.S. Patent N° 5,716,520 filed on August 20, 1996 in the name of Elmer B. Mason it is described a fluid magnetic conditioning device.

A further solution available on the market is the one sold by Alga-ex International.

Even if many solutions are known, by which the problem has been faced to separate impurities from diesel engine fuel, none of the known solutions allows to obtain an optimum separation.

In this context it is included the solution suggested according to the present invention, allowing to optimise the separation of impurities from the diesel engine fuel, thus realising an enhanced ionising effect.

A further object of the present invention is that of providing a solution that can be realised for devices having each dimension.

Still another object of the present invention is that of providing a device of the above kind wherein the fuel passes through a magnetic field created by at least two magnets placed outside its flow, but within the conduct.

It is therefore specific object of the present invention a magnetic conditioning device for diesel engine fuel comprising a hosing element, placed along the fuel feeding line, having a fuel inlet and a fuel outlet, and providing a septum in correspondence of the inlet to deviate the inlet fuel, and an obliged path for the fuel, being provided at least two opposed

magnetic elements, along said obliged path, inducing a magnetic field on the flowing fuel.

Preferably, according to the invention, said device provides a central cylindrical hub.

Furthermore, according to the invention, said obliged path has such a shape to ensure a long passage of the fuel within the device.

Always according to the invention, the magnetic field is created by permanent magnets, preferably neodymium magnets, having a protective anti-corrosion coating.

Still according to the invention, said permanent magnets can be comprised of ferrite.

Preferably, according to the invention, two permanent magnets are provided mounted opposed, said magnets having an opposed polarisation on the faces faced toward the fuel flow.

In a further embodiment of the device according to the invention, said magnetic elements are comprised of two ferromagnetic opposed elements, on which permanent magnets are provided, preferably having a tablet or ring shape, and an opposed polarisation of the faces faced toward the fuel flow, or with alternate polarisation between the permanent magnets placed side by side on the same ferromagnetic material, being provided permanent magnets having an opposed polarity respectively opposed faced each other.

Said permanent magnets can be flue with the ferromagnetic material or can be projecting with respect to the same.

Particularly, said permanent magnetic elements have a horseshoe shape.

Preferably, according to the invention, said device provides a lower portion and an upper portion, or lid, removably coupled each other.

Always according to the invention, projecting elements are provided, preferably metallic elements provided inside the container.

Preferably, said projecting elements are provided on one or both the inner surfaces of the device.

Furthermore, according to the invention, it can be provided an atmosphere vent.

Still according to the invention, said device can be comprised of a central body and two lids, respectively an upper and a lower lid.

The present invention will be now described, for illustrative but not limitative purposes, according to its preferred embodiments, with particular reference to the figures of the enclosed drawings, wherein:

figure 1 is a schematic perspective view of a first embodiment of a device according to the invention;

figure 2 is a first section view of the device of figure 1;

figure 3 is a second section view of the device of figure 1;

figure 4 is a schematic perspective view of a second embodiment of a device according to the invention;

figure 5 is a first section view of the device of figure 4;

figure 6 is a second section view of the device of figure 4;

figure 7 is a plan view of a device according to the first embodiment;

figure 8 is a section view of the device of figure 7;

figure 9 is a plan view of the lower part of the first embodiment of the device according to the invention;

figure 10 is a section view of the whole device of figure 9;

figures 11a and 11b are plan views of the lower and upper parts of a second embodiment according to the invention of figure 1;

figure 12 is a section view of the whole device of figure 10;

figures 13a and 13b are plan views of the lower and upper parts of a third embodiment according to the invention of figure 1;

figure 14 is a section view of the whole device of figure 13;

figures 15a and 15b are plan views of the lower and upper parts of a fourth embodiment according to the invention;

figure 16 is a section view of the whole device of figure 15;

figures 17a and 17b are plan views of the lower and upper parts of a fifth embodiment according to the invention;

figure 18 is a section view of the whole device of figure 17;

figures 19a and 19b are plan views of the lower and upper parts of a sixth embodiment according to the invention;

figure 20 is a plan view of the device of figures 19a and 19b;

figure 21 is a perspective view of the element of figure 19b;

figures 22a and 22b are plan views of the lower and upper parts of a seventh embodiment according to the invention; and

figure 23 is a plan view of the device of figures 22a and 22b.

device shown in the various enclosed figures exploits the magnetic field generated by permanent magnets to induce phenomenons of ionisation of the molecules present in the diesel engine fuel, obtaining the separation of particles accumulating within filters and tanks, that could cause a bad operation of engines, clogging filters and producing the accumulation of sludges within the tanks.

Observing the enclosed figures, wherein the various similar or corresponding elements are indicated by the same numeral references, and observing first figures 1 – 3 and figures 9 – 18, it can be noted a device according to the invention providing a box 1, within which a cylindrical space is realised delimited by the walls and a central cylinder. Within said space a septum 2 is provided in correspondence of the entrance (indicated by arrow A) of the fluid fuel, obliging the latter to cover the duct between walls and cylindrical hub within which the magnetic field is created.

Geometry of the device according to the invention is studied to ensure a long path of the fluid fuel within the magnetic field, in such a way to obtain a high efficiency of the ionising action.

As it can be noted from the figures, creation of the fuel is obtained by permanent magnets 4, preferably neodymium magnets, having an anti-wearing protective coating, or ferrite magnets, or other kind of magnets.

The use of neodymium, contrary to the ceramic magnets employing ferrite, allows to obtain high intensity of the magnetic field, with the same geometric sizes, far more higher than the other magnets, thus obtaining an increase of the performances.

Observing all the enclosed figures, it can be noted that the shape and the positioning of the magnets are innovative.

Magnets of the embodiment of figures 1 – 3 and 7 – 8 are comprised of two ring shaped permanent magnets 4, opposed each other, while in the embodiment shown in figures 4 – 6 are comprised of two opposed rings made up of ferromagnetic material, on which permanent magnets 4 are mounted, having a cylindrical integral tablet shape or a ring shape. Ring magnets and magnet bearing ferromagnetic rings are spaced in such a way to allow the fuel flowing through the duct inside the device, defined by their surface faced toward the inside of the box 1 and by the walls of the same box, and respectively placed on the bottom (lower ring)

5 and under the lid (upper ring) 6 on the cylinder placed at the centre of the device bow 1, that can be comprised of the same material of the box, or partially comprised of ferromagnetic material, or of other material.

In figures 19 – 21 and 22-23 two further embodiments of the device according to the invention are shown, wherein the elements corresponding to those of the previous embodiments are indicated by the same numeral references.

In the two solutions shown in the above figures, beside the magnets 4, projecting metallic elements 7 have been added, improving turbulence of the fuel.

The difference between the two embodiments is due that said projecting elements 7 are provided on all the two surfaces (figures 19 – 21) or only on the bottom 5 (figures 22 – 23), the choice depending on the dimensions and on the use of the device according to the invention.

Furthermore, in the device of figure 20 it is shown a vent 8 for venting air that could dangerously accumulate within the container 1. The provision of the vent 8 too is due to the dimensions and to the use of the device according to the invention.

In the embodiment providing the use of ring permanent magnets, magnetic polarisation is opposed on the upper and lower faces of each ring and the rings are mounted in such a way that their surfaces faced toward the inner duct have opposed polarity.

When ferromagnetic rings and multiple permanent magnets are provided, permanent magnets have a cylindrical tablet or ring shape, with north and south polarity on the full opposed faces of the same tablet, having such dimensions to be mounted on the ferromagnetic rings along a single or more rows.

In case multiple permanent magnets are provided, magnets are fixed on the rings by not ferromagnetic screws or by fixed joint and provided according to a simple or multiple circle, with the same magnetic polarity faced toward the surface of each ring.

As it is well evident, surface of the tablets faced inside the duct can be flue with the same surface of the ferromagnetic ring on which they are mounted, or slightly projecting, in order to create a turbulence in the fluid. Said turbulence has a positive effect in promoting the action of the device according to the invention.

By this positioning, each one of the ferromagnetic rings becomes a single permanent magnet, faced toward the space where a single magnetic polarisation flows.

Positioning of the magnetic tablets is realised in such a way that the lower ring and the upper ring have opposed polarity, thus creating within the inner space included between them a high intensity uniform magnetic field.

Central cylinder, if made up of ferromagnetic material, is in touch with the lower ferromagnetic ring, but has a cylindrical spacer, made up of not ferromagnetic material, with respect to the upper ring, in such a way to create a space wherein a magnetic field exists.

It is further provided a further embodiment comprised of a ferromagnetic cylinder, having a small thickness and empty inside, that can be placed as a coating of the lateral wall of the device box. This solution allows to substantially annul the field outside the box of the device, thus realising a path for the closure of the magnetic field between the upper ring and the lower ring with a reluctance reduced with respect to the outer space.

All the described constructive choices allow to obtain intensity and distribution of the dimensions of the circulation channel for the fuel fluid, necessary by the engine power to which the device is applied.

Furthermore, the use of the constructive and technological solutions allows to limit the magnetic field dispersed outside the device and to concentrate the same inside the space useful for the exposition of the fuel fluid.

The present invention has been described for illustrative but not limitative purposes, according to its preferred embodiments, but it is to be understood that modifications and/or changes can be introduced by those skilled in the art without departing from the relevant scope as defined in the enclosed claims.

CLAIMS

1. Magnetic conditioning device for diesel engine fuel characterised in that it comprises a housing element, placed along the fuel feeding line, having a fuel inlet and a fuel outlet, and providing a septum in correspondence of the inlet to deviate the inlet fuel, and an obliged path for the fuel, being provided at least two opposed magnetic elements, along said obliged path, inducing a magnetic field on the flowing fuel.

2. Magnetic conditioning device for diesel engine fuel according to claim 1, characterised in that said device provides a central cylindrical hub.

3. Magnetic conditioning device for diesel engine fuel according to claim 2 or 3, characterised in that said obliged path has such a shape to ensure a long passage of the fuel within the device.

4. Magnetic conditioning device for diesel engine fuel according to one of the preceding claims, characterised in that the magnetic field is created by permanent magnets.

5. Magnetic conditioning device for diesel engine fuel according to claim 4, characterised in that said permanent magnets are comprised of neodymium magnets, having a protective anti-corrosion coating.

6. Magnetic conditioning device for diesel engine fuel according to one of the preceding claims 1 - 3, characterised in that said permanent magnets are comprised of ferrite.

7. Magnetic conditioning device for diesel engine fuel according to one of the preceding claims, characterised in that two permanent magnets are provided mounted opposed, said magnets having an opposed polarisation on the faces faced toward the fuel flow.

8. Magnetic conditioning device for diesel engine fuel according to one of the preceding claims 1 - 6, characterised in that said magnetic elements are comprised of two ferromagnetic opposed elements, on which permanent magnets are provided.

9. Magnetic conditioning device for diesel engine fuel according to claim 8, characterised in that said permanent magnets are comprised of integral tablets or rings, having an opposed polarisation of the faces faced toward the fuel flow.

10. Magnetic conditioning device for diesel engine fuel according to claim 8, characterised in that said permanent magnets are

comprised of integral tablets or rings, having an alternate polarisation between the permanent magnets placed side by side on the same ferromagnetic material, being provided permanent magnets having an opposed polarity respectively opposed faced each other.

11. Magnetic conditioning device for diesel engine fuel according to claim 8, 9 or 10, characterised in that said permanent magnets are flue with the ferromagnetic material or projecting with respect to the same.

12. Magnetic conditioning device for diesel engine fuel according to claim 8 or 9, characterised in that said permanent magnetic elements have a horseshoe shape.

13. Magnetic conditioning device for diesel engine fuel according to one of the preceding claims, characterised in that said device provides a lower portion and an upper portion, or lid, removably coupled each other.

14. Magnetic conditioning device for diesel engine fuel according to one of the preceding claims, characterised in that projecting elements are provided, preferably metallic elements provided inside the container.

15. Magnetic conditioning device for diesel engine fuel according to claim 14, characterised in that said projecting elements are provided on one or both the inner surfaces of the device.

16. Magnetic conditioning device for diesel engine fuel according to one of the preceding claims, characterised in that it is provided an atmosphere vent.

17. Magnetic conditioning device for diesel engine fuel according to one of the preceding claims, characterised in that said device is comprised of a central body and two lids, respectively an upper and a lower lid.

18. Magnetic conditioning device for diesel engine fuel according to each one of the preceding claims, substantially as illustrated and described.

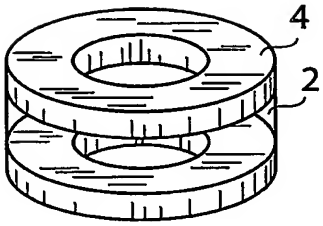


Fig. 1

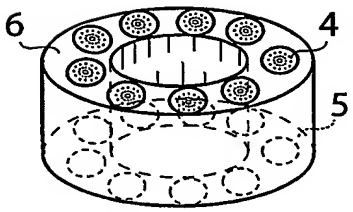


Fig. 4

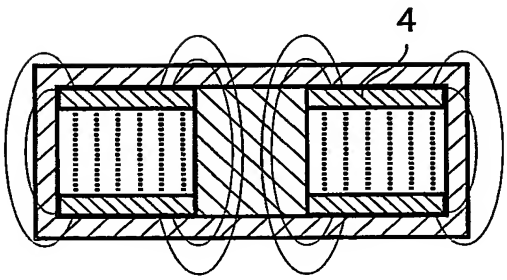


Fig. 2

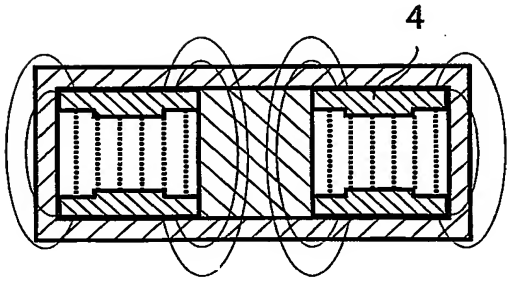


Fig. 5

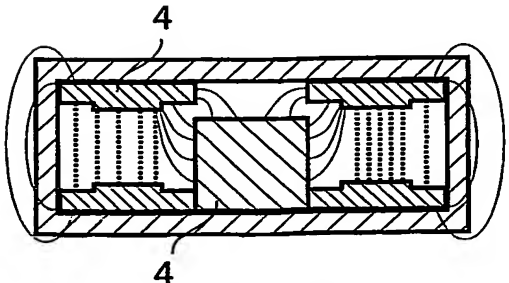


Fig. 3

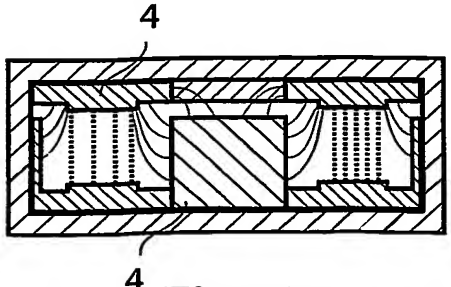


Fig. 6

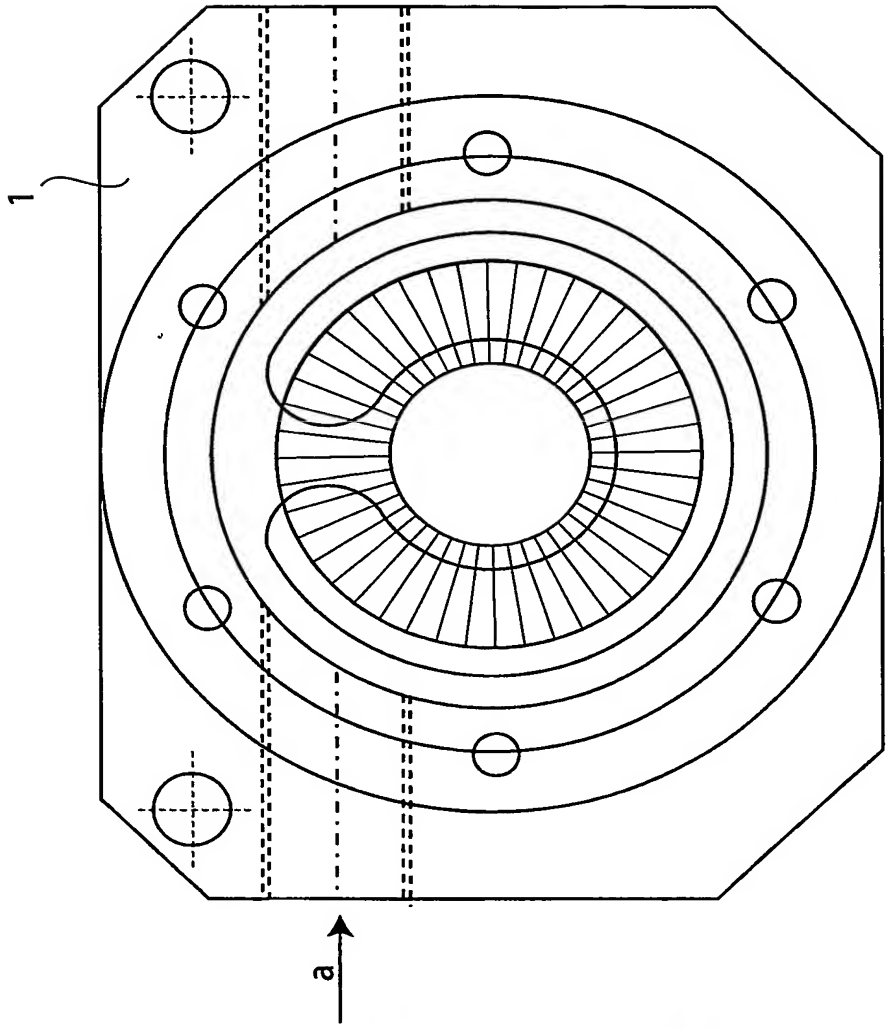


Fig.7

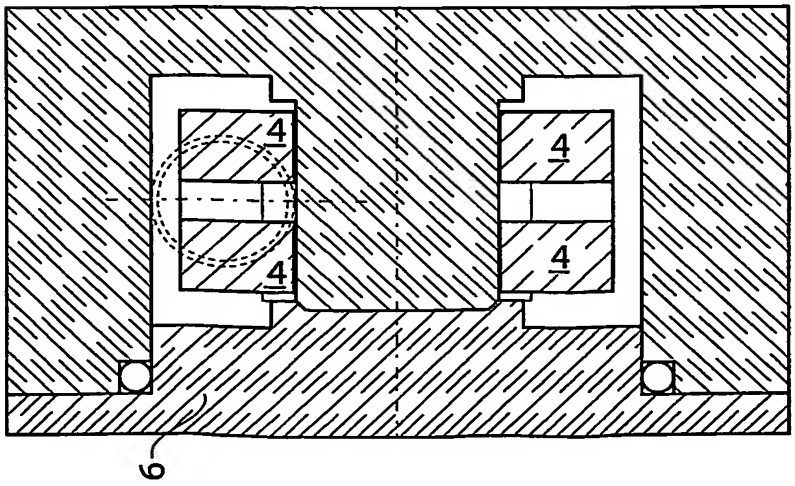


Fig.8

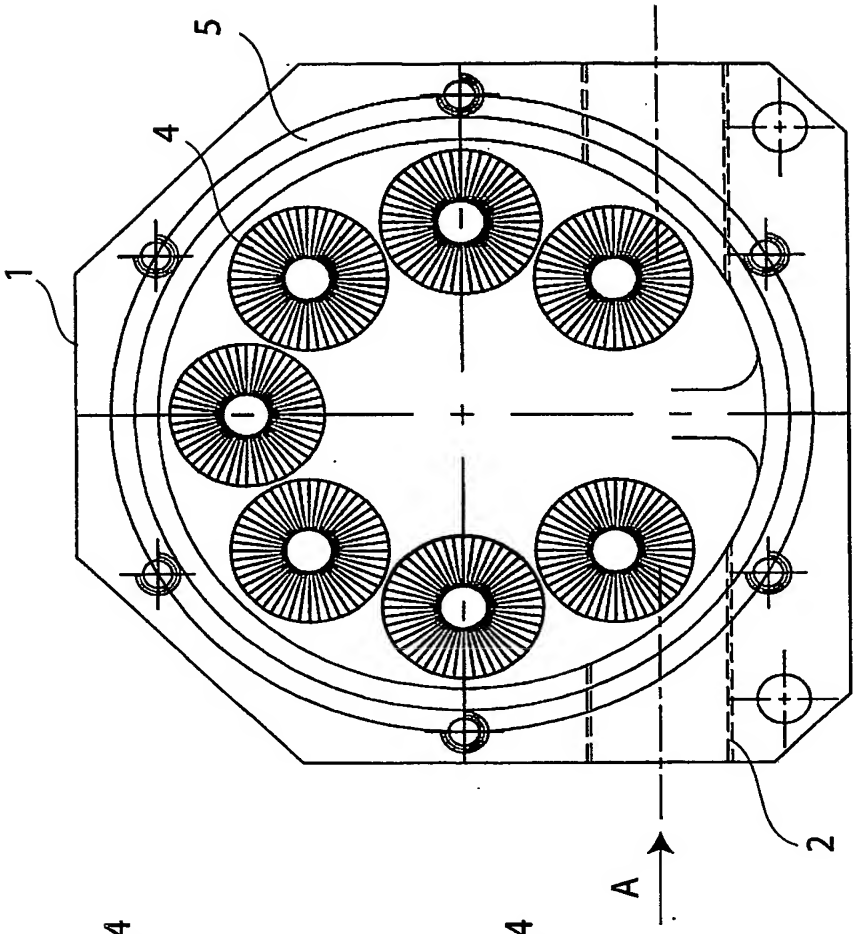


Fig.9

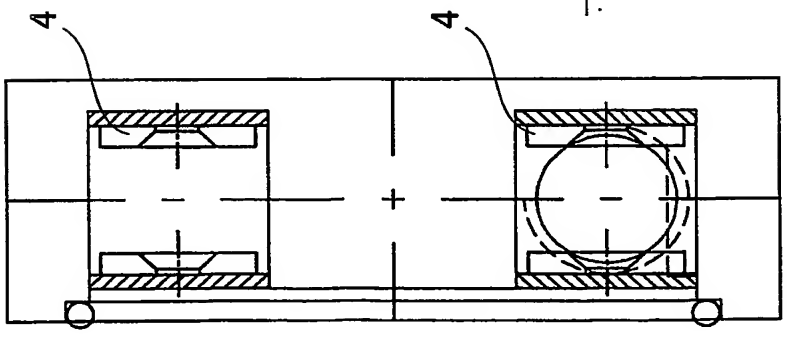


Fig.10

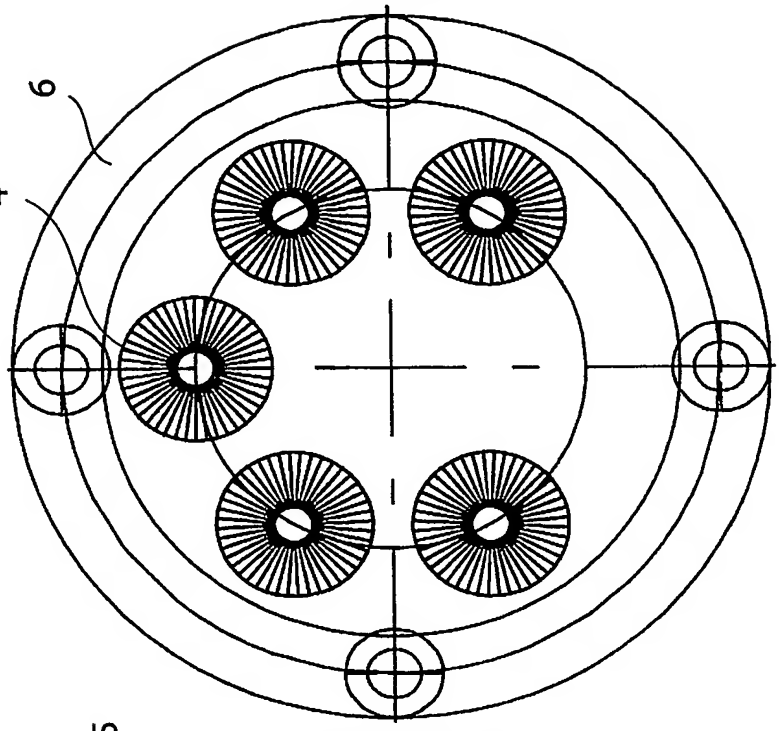


Fig. 11b

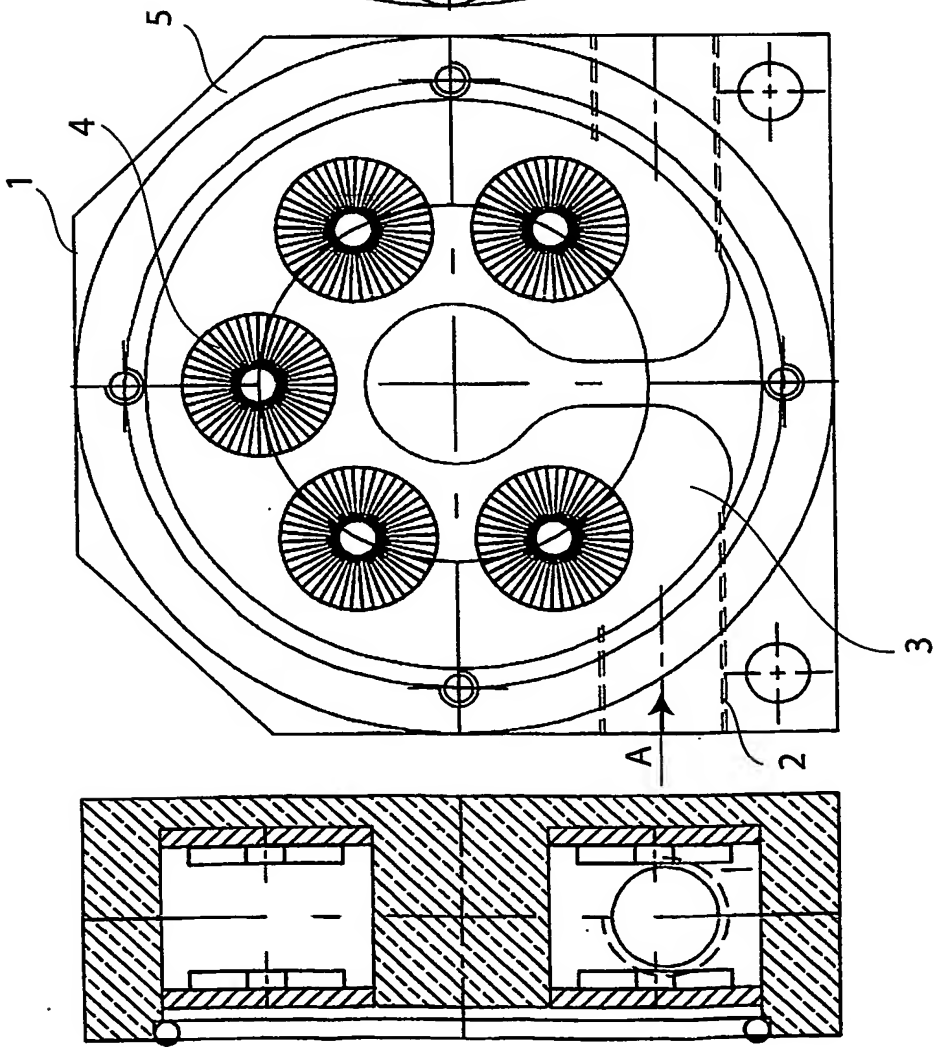


Fig. 11a

Fig. 12

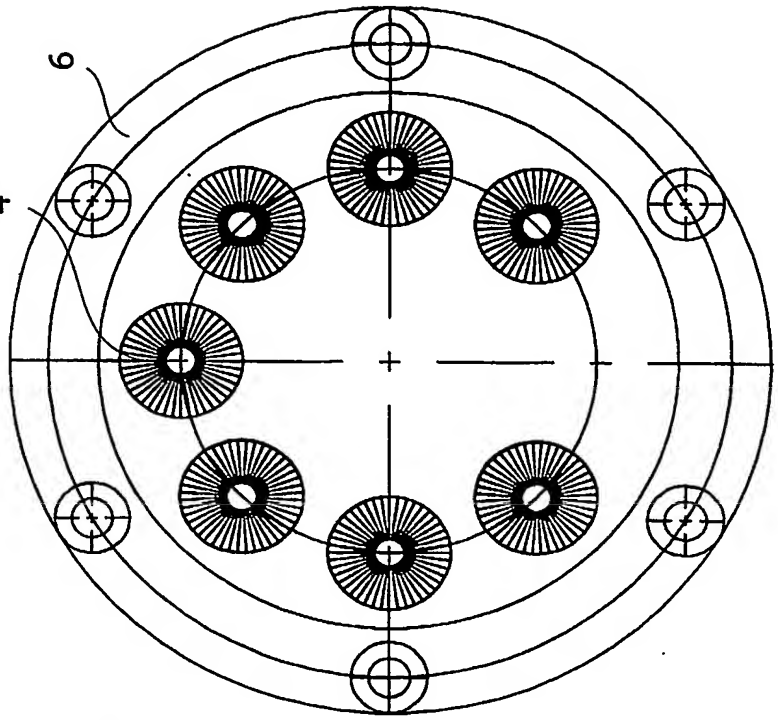


Fig. 13b

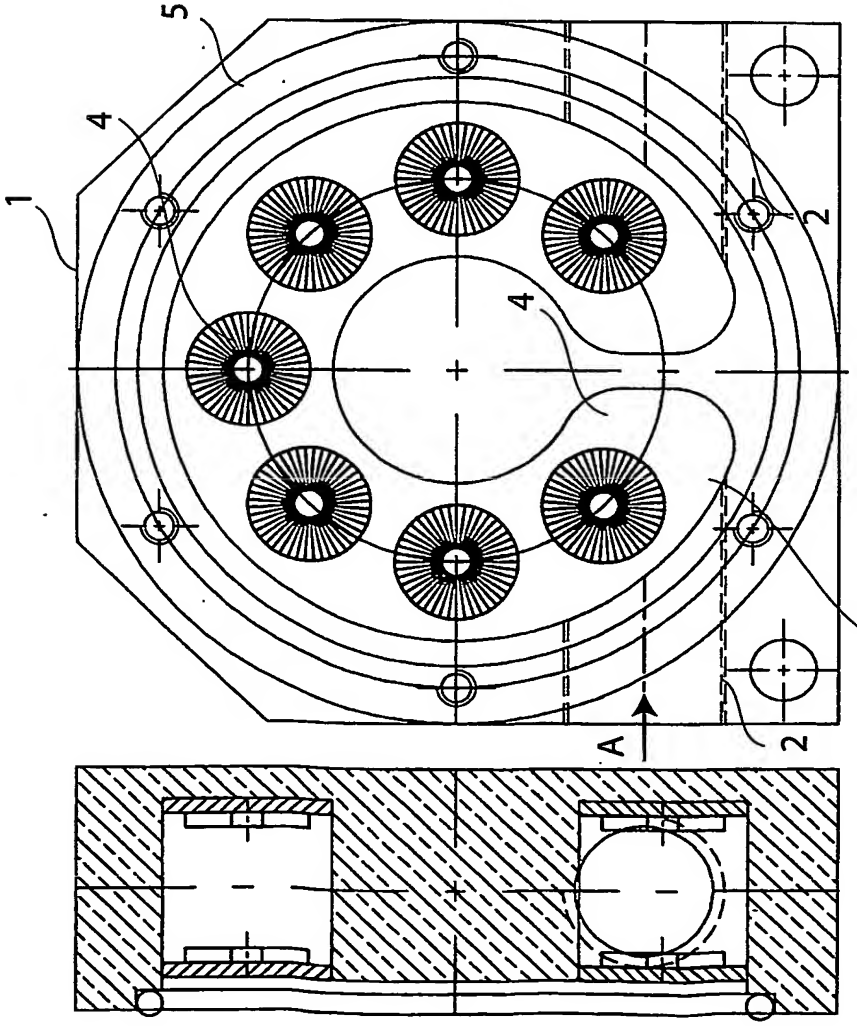


Fig. 13a

Fig. 14

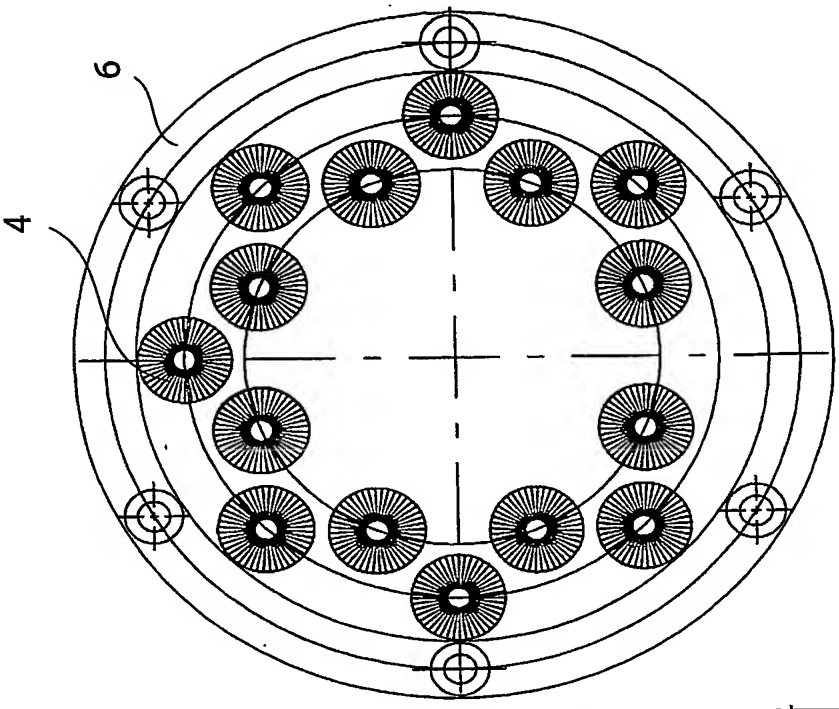


Fig. 15b

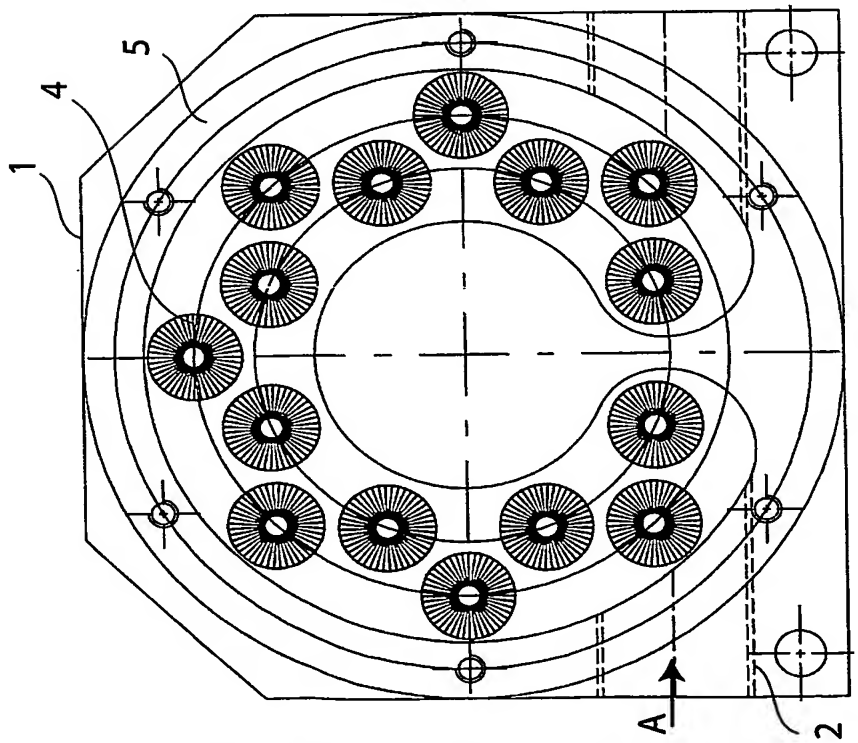


Fig. 15a

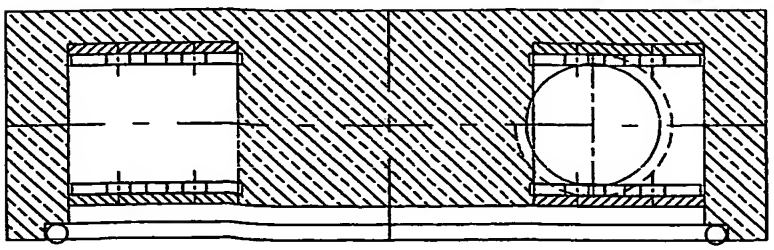


Fig. 16

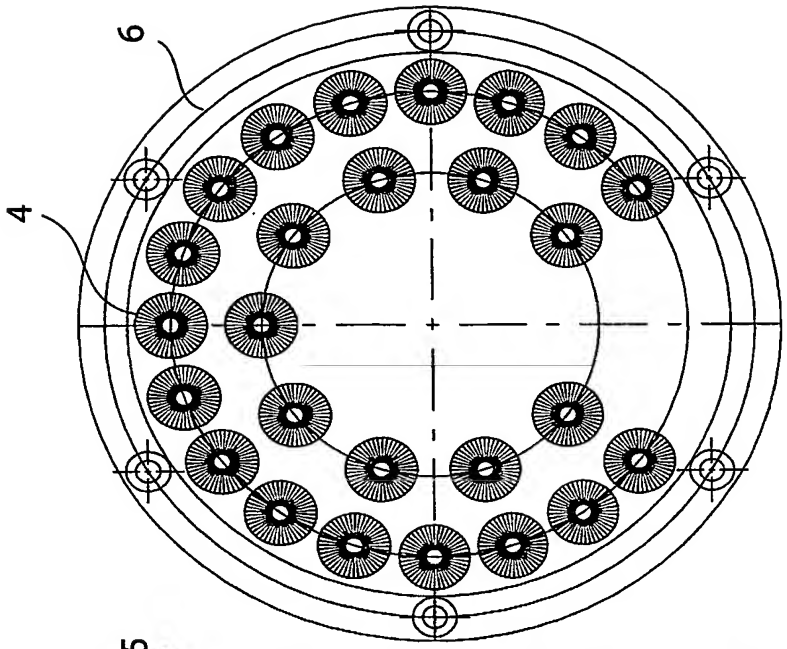


Fig.17b

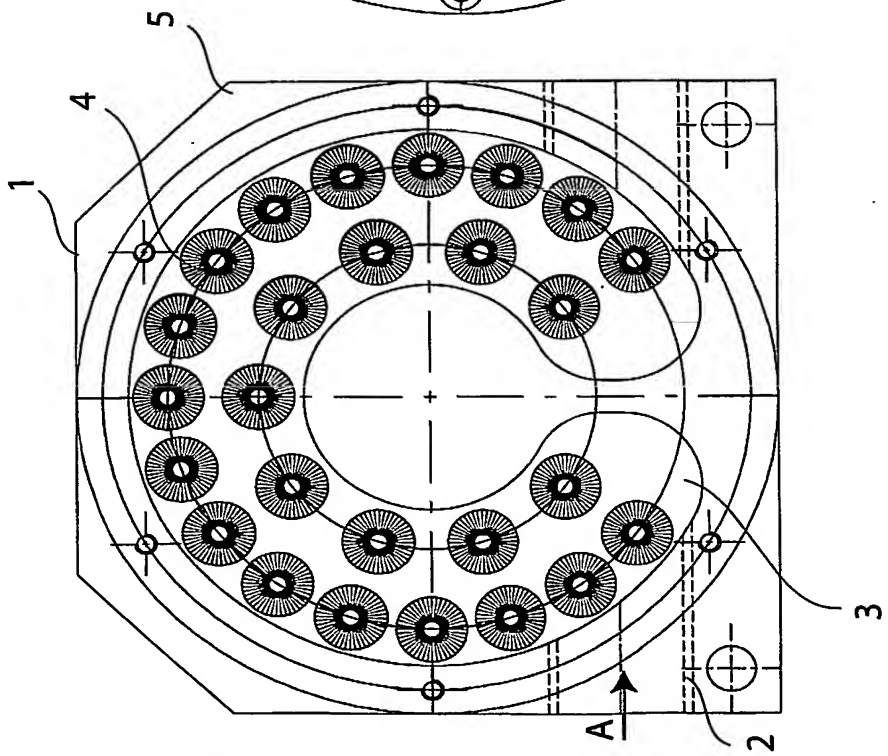


Fig.17a

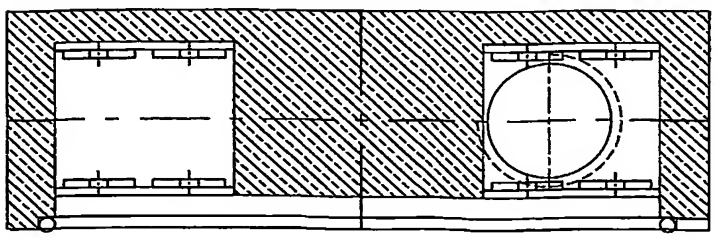


Fig.18

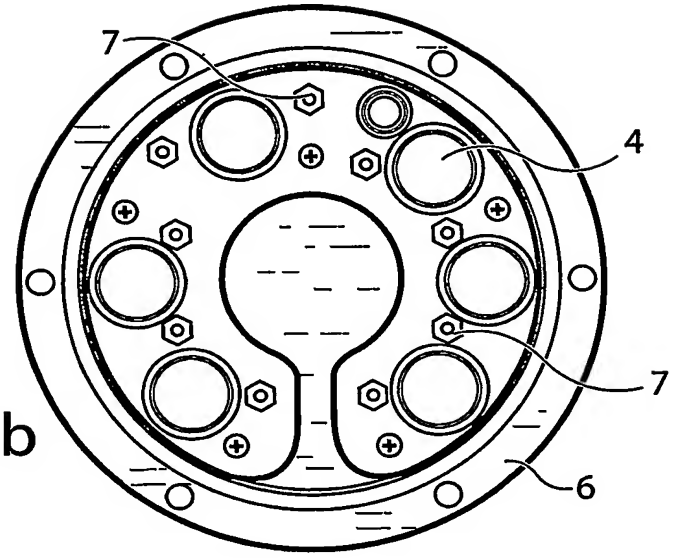


Fig. 19b

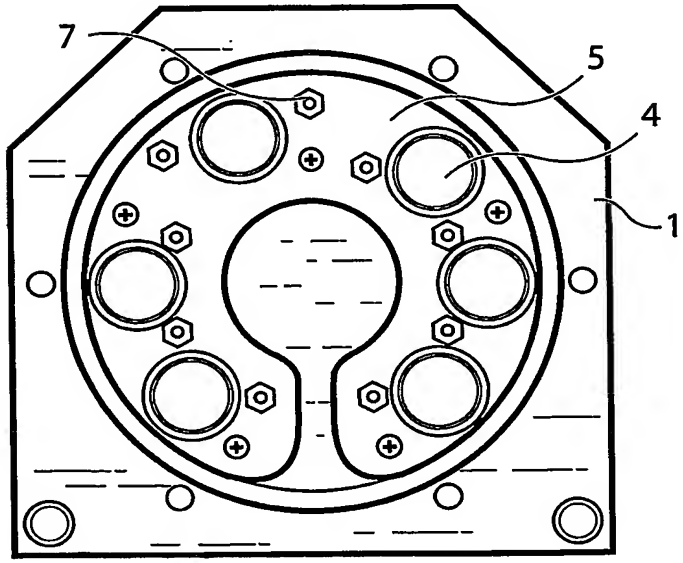


Fig. 19a

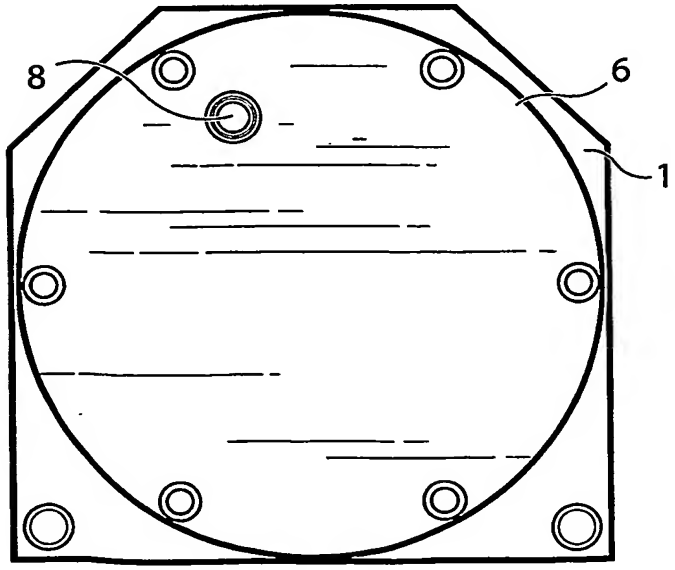


Fig. 20

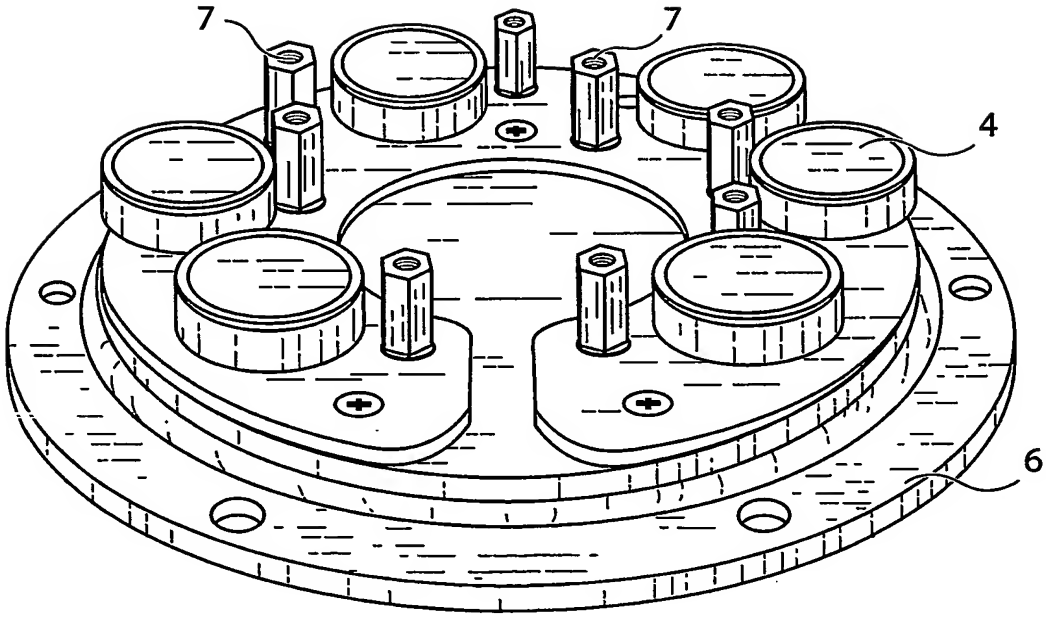


Fig. 21

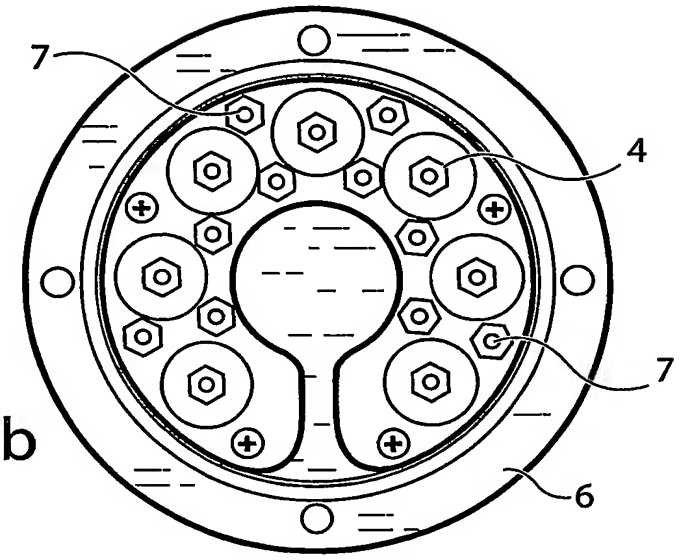


Fig. 22b

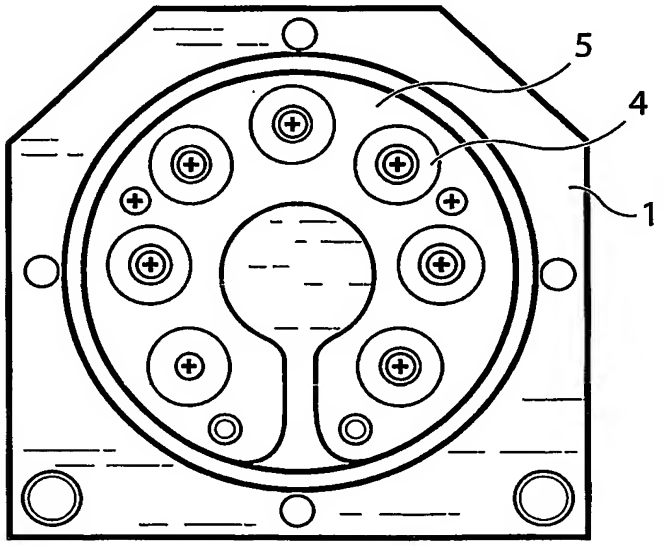


Fig. 22a

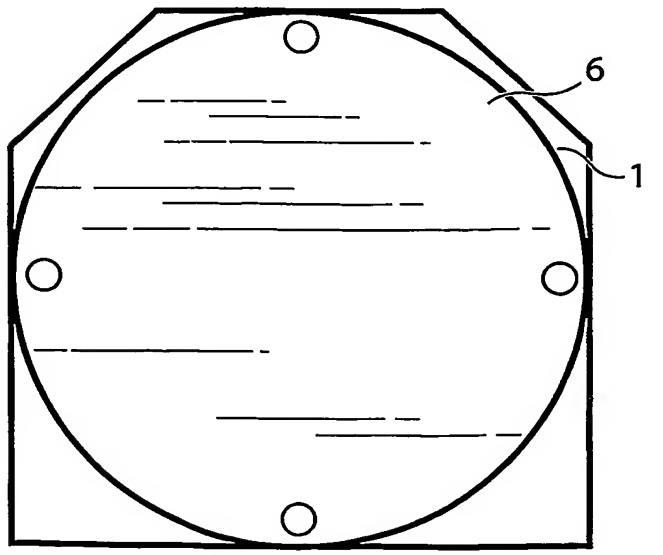


Fig. 23

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IT 03/00576

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 F02M27/04 F02B51/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 F02M F02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 050 426 A (SANDERSON CHARLES H) 27 September 1977 (1977-09-27) figure 2 abstract column 2, line 45 - column 3, line 68	1-4,7-11
X	EP 0 399 801 A (WRIBRO LTD) 28 November 1990 (1990-11-28) figures 1-4 abstract claims 1-8	1-4,6-11
X	WO 97/29279 A (IM CHE MOON) 14 August 1997 (1997-08-14) figures 1-8 abstract claims 1-13 page 7, line 3 - line 8	1-4,6-11

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 February 2004	16/02/2004

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Wassenaar, G

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/IT 03/00576

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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